

This listing of claims will replace all prior versions,
and listings, of claims in the application:

1 Claim 1 (currently amended): A computer-implemented method
2 comprising:

- 3 a) accepting forwarding liveness status information
4 of at least two different interfaces;
5 b) composing a message including the forwarding
6 liveness status information; and
7 c) sending the message towards a neighbor node.

1 Claim 2 (currently amended): The computer-implemented
2 method of claim 1 further comprising:

- 3 d) maintaining a first timer for tracking a send time
4 interval, wherein the acts of composing a message and
5 sending the message are performed after expiration of
6 the first timer; and
7 e) restarting the first timer after the message is
8 sent.

1 Claim 3 (currently amended): The computer-implemented
2 method of claim 2 wherein the message further includes a
3 dead time interval, and wherein the send time interval is
4 less than the dead time interval.

1 Claim 4 (currently amended): The computer-implemented
2 method of claim 2 wherein the message further includes a
3 dead time interval, and wherein the send time interval is
4 no more than one third of the dead time interval.

1 Claim 5 (currently amended): The computer-implemented
2 method of claim 2 wherein the send time interval is less
3 than one second.

1 Claim 6 (currently amended): The computer-implemented
2 method of claim 2 wherein the send time interval is less
3 than 100 msec.

1 Claim 7 (currently amended): The computer-implemented
2 method of claim 1 wherein the message further includes a
3 dead time interval.

1 Claim 8 (currently amended): The computer-implemented
2 method of claim 1 wherein the act of sending the message
3 includes providing the message in an Internet protocol
4 packet.

1 Claim 9 (currently amended): The computer-implemented
2 method of claim 8 wherein the message is sent towards the
3 neighbor node by setting a destination address in the
4 Internet protocol packet to a multicast address associated
5 with routers that support aggregated interface forwarding
6 liveness.

1 Claim 10 (currently amended): The computer-implemented
2 method of claim 1 wherein the status information includes a
3 forwarding liveness state selected from a group of
4 forwarding liveness states consisting of (A) interface up,
5 (B) interface down, (C) interface monitor not reporting,
6 and (D) forwarding engine restarting.

1 Claim 11 (currently amended): For use with a node, a
2 computer-implemented method comprising:
3 a) receiving a message including
4 i) forwarding liveness status information for a
5 first set of at least two different interfaces,
6 and
7 ii) a time interval; and
8 b) updating neighbor node forwarding liveness status
9 information using the message.

1 Claim 12 (currently amended): The computer-implemented
2 method of claim 11 wherein the act of updating neighbor
3 node liveness status information includes
4 i) setting a first timer to the time interval
5 and starting the first timer,
6 ii) if the first timer expires, setting a status
7 of each of the at least two different interfaces
8 ~~an interface~~ of the neighbor node to down; and
9 iii) if a further message, sourced from the
10 neighbor node, and including
11 A) forwarding liveness status information,
12 and
13 B) a new time interval,
14 is received then, resetting the first timer to
15 the new time interval and restarting the first
16 timer.

1 Claim 13 (currently amended): The computer-implemented
2 method of claim 12 wherein each of the time interval and
3 the new time interval is less than one second.

1 Claim 14 (currently amended): The computer-implemented
2 method of claim 11 wherein the forwarding liveness status
3 information is interface forwarding liveness status
4 information.

1 Claim 15 (currently amended): The computer-implemented
2 method of claim 11 wherein the status information includes
3 a forwarding liveness state selected from a group of
4 forwarding liveness states consisting of (A) interface up,
5 (B) interface down, (C) interface monitor not reporting,
6 and (D) forwarding engine restarting.

1 Claim 16 (currently amended): The computer-implemented
2 method of claim 11 wherein the forwarding liveness status
3 information includes at least one of (i) the integrity and
4 correct operation of forwarding tables, (ii) the integrity
5 and correct operation of switch fabric, (iii) the integrity
6 and correct operation of a forwarding lookup engine, (iv)
7 the integrity and correct operation of a traffic scheduler,
8 (v) the integrity and correct operation of a traffic
9 classifier, (vi) the integrity and correct operation of
10 buffers in the data plane, (vii) the integrity and correct
11 operation of packet segmentation modules, (viii) the
12 integrity and correct operation of packet reassembly
13 modules, (ix) the integrity and correct operation of packet
14 re-sequencing modules, (x) whether or not a node is
15 restarting, (xi) whether or not the forwarding plane is
16 congested, or and (xii) the integrity and correct operation
17 of fragmentation modules.

1 Claim 17 (currently amended): The computer-implemented
2 method of claim 11 wherein the forwarding liveness status

3 information includes at least one of (i) bit error rate at
4 a link interface, and (ii) clock synchronization at a link
5 interface.

1 Claim 18 (currently amended): A computer-implemented
2 method for monitoring interface forwarding liveness, the
3 method comprising:

- 4 a) determining, at a first node, forwarding liveness
5 status information for at least two different
6 interfaces ~~an interface~~;
- 7 b) sending, from the first node, a message including
8 the determined status information;
- 9 c) receiving, at the second node, the message; and
- 10 d) updating, by the second node, first node
11 forwarding liveness status information using the
12 message.

1 Claim 19 (currently amended): The computer-implemented
2 method of claim 18 wherein the message further includes a
3 dead interval, and wherein the act of updating first node
4 forwarding liveness status information includes
5 i) setting a timer to the dead interval;
6 ii) starting the timer;
7 iii) determining whether or not a further
8 message including forwarding liveness status
9 information is received from the first node
10 before the expiration of the timer; and
11 iv) if it is determined that a further message
12 including forwarding liveness status information
13 is not received from the first node by the second
14 node before the expiration of the timer, then
15 informing the second node that the at least two

16 different interfaces ~~interface~~ of the first node
17 ~~is~~ are down.

1 Claim 20 (currently amended): The computer-implemented
2 method of claim 18 wherein the status information includes
3 a forwarding liveness state selected from a group of
4 forwarding liveness states consisting of (A) interface up,
5 (B) interface down, (C) interface monitor not reporting,
6 and (D) forwarding engine restarting.

1 Claim 21 (currently amended): The computer-implemented
2 method of claim 18 wherein the forwarding liveness status
3 information includes at least one of (i) the integrity and
4 correct operation of forwarding tables, (ii) the integrity
5 and correct operation of switch fabric, (iii) the integrity
6 and correct operation of a forwarding lookup engine, (iv)
7 the integrity and correct operation of a traffic scheduler,
8 (v) the integrity and correct operation of a traffic
9 classifier, (vi) the integrity and correct operation of
10 buffers in the data plane, (vii) the integrity and correct
11 operation of packet segmentation modules, (viii) the
12 integrity and correct operation of packet reassembly
13 modules, (ix) the integrity and correct operation of packet
14 re-sequencing modules, (x) whether or not a node is
15 restarting, (xi) whether or not the forwarding plane is
16 congested, or ~~and~~ (xii) the integrity and correct operation
17 of fragmentation modules.

1 Claim 22 (currently amended): The computer-implemented
2 method of claim 18 wherein the forwarding liveness status
3 information includes at least one of (i) bit error rate at

4 a link interface, and (ii) clock synchronization at a link
5 interface.

1 Claim 23 (currently amended): A machine-readable medium
2 having stored thereon a machine readable data structure
3 comprising:

- 4 a) an indication, for at least two different
5 interfaces ~~an interface~~ of a node, of a forwarding
6 liveness state of the interface; and
7 b) a dead interval.

1 Claim 24 (original): The machine-readable medium of claim
2 23 wherein the indication indicates a forwarding liveness
3 state selected from a group of forwarding liveness states
4 consisting of (A) interface up, (B) interface down, (C)
5 interface monitor not reporting, and (D) forwarding engine
6 restarting.

1 Claim 25 (currently amended): The machine-readable medium
2 of claim 23 wherein the indication indicates a forwarding
3 liveness of an interface and includes at least one of (i)
4 the integrity and correct operation of forwarding tables,
5 (ii) the integrity and correct operation of switch fabric,
6 (iii) the integrity and correct operation of a forwarding
7 lookup engine, (iv) the integrity and correct operation of
8 a traffic scheduler, (v) the integrity and correct
9 operation of a traffic classifier, (vi) the integrity and
10 correct operation of buffers in the data plane, (vii) the
11 integrity and correct operation of packet segmentation
12 modules, (viii) the integrity and correct operation of
13 packet reassembly modules, (ix) the integrity and correct
14 operation of packet re-sequencing modules, (x) whether or

15 not a node is restarting, (xi) whether or not the
16 forwarding plane is congested, ~~and~~ or (xii) the integrity
17 and correct operation of fragmentation modules.

1 Claim 26 (original): The machine-readable medium of claim
2 23 further comprising:

3 c) an identifier of the node.

1 Claim 27 (original): The machine-readable medium of claim
2 26 wherein the node is a router and wherein the identifier
3 is a router identifier.

1 Claim 28 (original): The machine-readable medium of claim
2 23 further comprising:

3 c) an interface index.

1 Claim 29 (currently amended): For use with a node,
2 elements comprising:

3 a) means for accepting forwarding liveness status
4 information of at least two different interfaces;
5 b) means for composing a message including the
6 forwarding liveness status information; and
7 c) means for sending the message towards a neighbor
8 node.

1 Claim 30 (original): The elements of claim 29 further
2 comprising:

3 d) means for maintaining a first timer for tracking a
4 send time interval, wherein the means for composing a
5 message and sending the message compose and send the
6 message after expiration of the first timer; and

7 e) means for restarting the first timer after the
8 message is sent.

1 Claim 31 (original): The elements of claim 30 wherein the
2 message further includes a dead time interval, and wherein
3 the send time interval is less than the dead time interval.

1 Claim 32 (original): The elements of claim 30 wherein the
2 message further includes a dead time interval, and wherein
3 the send time interval is no more than one third of the
4 dead time interval.

1 Claim 33 (original): The elements of claim 30 wherein the
2 send time interval is less than one second.

1 Claim 34 (original): The elements of claim 30 wherein the
2 send time interval is less than 100 msec.

1 Claim 35 (original): The elements of claim 29 wherein the
2 message further includes a dead time interval.

1 Claim 36 (original): The elements of claim 29 wherein the
2 means for sending the message include means for providing
3 the message in an Internet protocol packet.

1 Claim 37 (original): The elements of claim 36 wherein the
2 means for sending the message include means for setting a
3 destination address in the Internet protocol packet to a
4 multicast address associated with routers that support
5 interface forwarding liveness.

1 Claim 38 (original): The elements of claim 29 wherein the
2 status information includes a forwarding liveness state
3 selected from a group of forwarding liveness states
4 consisting of (A) interface up, (B) interface down, (C)
5 interface monitor not reporting, and (D) forwarding engine
6 restarting.

1 Claim 39 (currently amended): For use with a node,
2 elements comprising:
3 a) means for receiving a message including
4 i) forwarding liveness status information for a
5 first set of at least two different interfaces,
6 and
7 ii) a time interval; and
8 b) means for updating neighbor node forwarding
9 liveness status information using the message.

1 Claim 40 (currently amended): The elements of claim 39
2 wherein the means for updating neighbor node liveness
3 status information include
4 i) means for setting a first timer to the time
5 interval and starting the first timer,
6 ii) means for setting a status of each of the at
7 least two different interfaces ~~an interface~~ of
8 the neighbor node to down if the first timer
9 expires; and
10 iii) means, if a further message, sourced from
11 the neighbor node, and including
12 A) forwarding liveness status information,
13 and
14 B) a new time interval,

15 is received, for resetting the first timer to the
16 new time interval and restarting the first timer.

1 Claim 41 (original): The elements of claim 39 wherein each
2 of the time interval and the new time interval is less than
3 one second.

1 Claim 42 (original): The elements of claim 39 wherein the
2 forwarding liveness status information is interface
3 forwarding liveness status information.

1 Claim 43 (original): The elements of claim 39 wherein the
2 status information includes a forwarding liveness state
3 selected from a group of forwarding liveness states
4 consisting of (A) interface up, (B) interface down, (C)
5 interface monitor not reporting, and (D) forwarding engine
6 restarting.

1 Claim 44 (currently amended): The elements of claim 39
2 wherein the forwarding liveness status information includes
3 at least one of (i) the integrity and correct operation of
4 forwarding tables, (ii) the integrity and correct operation
5 of switch fabric, (iii) the integrity and correct operation
6 of a forwarding lookup engine, (iv) the integrity and
7 correct operation of a traffic scheduler, (v) the integrity
8 and correct operation of a traffic classifier, (vi) the
9 integrity and correct operation of buffers in the data
10 plane, (vii) the integrity and correct operation of packet
11 segmentation modules, (viii) the integrity and correct
12 operation of packet reassembly modules, (ix) the integrity
13 and correct operation of packet re-sequencing modules, (x)
14 whether or not a node is restarting, (xi) whether or not

15 the forwarding plane is congested, ~~and~~ or (xii) the
16 integrity and correct operation of fragmentation modules.

1 Claim 45 (original): The elements of claim 39 wherein the
2 forwarding liveness status information includes at least
3 one of (i) bit error rate at a link interface, and (ii)
4 clock synchronization at a link interface.

1 Claim 46 (currently amended): A system comprising:

2 a) a first node including

3 i) means for determining, at a first node,
4 forwarding liveness status information for an
5 interface at least two different interfaces, and
6 ii) means for sending a message including the
7 determined status information; and

8 b) a second node including

9 i) means for receiving the message, and
10 ii) means for updating first node forwarding
11 liveness status information using the message.

1 Claim 47 (currently amended): The system of claim 46
2 wherein the message further includes a dead interval, and
3 wherein the means for updating first node forwarding
4 liveness status information include

5 i) means for setting a timer to the dead
6 interval;

7 ii) means for starting the timer;

8 iii) means for determining whether or not a
9 further message including forwarding liveness
10 status information is received from the first
11 node before the expiration of the timer; and

12 iv) means for informing the second node that the
13 ~~interface~~ at least two different interfaces of
14 the first node ~~is~~ are down if it is determined
15 that a further message including forwarding
16 liveness status information is not received from
17 the first node by the second node before the
18 expiration of the timer.

1 Claim 48 (original): The network of claim 46 wherein the
2 status information includes a forwarding liveness state
3 selected from a group of forwarding liveness states
4 consisting of (A) interface up, (B) interface down, (C)
5 interface monitor not reporting, and (D) forwarding engine
6 restarting.

1 Claim 49 (currently amended): The system of claim 46
2 wherein the forwarding liveness status information includes
3 at least one of (i) the integrity and correct operation of
4 forwarding tables, (ii) the integrity and correct operation
5 of switch fabric, (iii) the integrity and correct operation
6 of a forwarding lookup engine, (iv) the integrity and
7 correct operation of a traffic scheduler, (v) the integrity
8 and correct operation of a traffic classifier, (vi) the
9 integrity and correct operation of buffers in the data
10 plane, (vii) the integrity and correct operation of packet
11 segmentation modules, (viii) the integrity and correct
12 operation of packet reassembly modules, (ix) the integrity
13 and correct operation of packet re-sequencing modules, (x)
14 whether or not a node is restarting, (xi) whether or not
15 the forwarding plane is congested, ~~and~~ or (xii) the
16 integrity and correct operation of fragmentation modules.

1 Claim 50 (original): The system of claim 46 wherein the
2 forwarding liveness status information includes at least
3 one of (i) bit error rate at a link interface, and (ii)
4 clock synchronization at a link interface.